

# Group Use of Programed Instruction as a Means of Generating Homogeneous Study Groups<sup>1</sup>

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Extensive use of existing linear programed textbooks has convinced the writer that extra-program experiences are necessary if the program's contents are to be used effectively. This is the legitimate domain of the classroom teacher. Unfortunately the individual, self-paced study of programed textbooks makes it extremely difficult for the classroom teacher to provide extra-program, integrative experiences. The reason can be traced to the differences in reading rate and retention that obtain in the typical classroom: one student is 200 frames ahead of another student but knows little of what he has read, while another student is slowly and diligently examining each frame.

Because of these diversities in performance, the teacher's time and competencies cannot be utilized effectively. Some publisher's manuals say that the differences in student performance are an advantage; they enable the teacher to work with the individual students. This is a naive view since it is doubtful that any teacher is continually going to go from student to

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student answering the same questions and providing the same instructions and advice. If a teacher is to be maximally effective, it is essential that her competencies be used most effectively. They can be used most effectively when the teacher is given the opportunity to provide extra-program experiences for groups of students.

The purpose of this study was to determine whether it would be possible through the group use of programmed materials to identify groups of students sufficiently alike on tests of retention to be labeled "homogeneous." For such groups the teacher could presumably provide extra-program experiences that were specific and concentrated. It should be emphasized that this study did not seek to identify the extra-program experiences, but rather, to determine whether homogeneous groups could be identified within a single classroom when programmed materials were used under group-study conditions rather than the customary individual self-paced use.

Although programs have been used effectively with groups (Carpenter, 1963; Frye, 1963; Crist, 1967), the writer identified a defect attending the group use of programs which this study also attempted to investigate. In the group use as he employed it with junior high students, a programmed frame was flashed upon a screen and an *S* was called upon to emit the preferred response. When *S* emitted the preferred response (a response made easy by the program's low error rate), it was assumed that he had read and responded to all of the material within the frame. This assumption was false; many *Ss* read the frame only after being called upon and then read only enough of the frame to be sure their response was correct. In many instances this consisted of reading only a few words on each side of the blank. This is undesirable behavior since it is essential that the student respond to the total frame.

A secondary objective of this study was to determine whether a unique type of within-frame prompt might reduce the above defect.

**METHOD**  
*Subjects* One intact junior high school classroom having 27 students was used in this study. Students in the classroom were about average both socioeconomically and academically. The class mean on the California Test of Mental Maturity was 105.2, with scores ranging from 95 to 115.

*Material* The programmed textbook *Prevention of Communicable Disease*

was used in this study. The book has 357 frames, some of which contain as many as 75 words.

The Technicolor 200 projector was the means for presenting the program frames. The projector uses continuous loop 8mm film and is cartridge loaded. A major advantage is that one cartridge holds 4000 frames of economical 8mm film. The projector runs continuously like a conventional movie projector, or it can expose one frame at a time as was done in this study.

Prior to being placed on 8mm film, the complete program was retyped on 3x5 cards. Individual frames were kept under 30 words, with average frames having about 17 words. All of the original program's preferred responses were typed into the frame. No efforts were taken to make the preferred responses demanded by this study congruent with those required by the original program.

As a first step each retyped frame was carefully read to decide which word should be blanked out. No effort was made to select the most important or necessary word, but rather, the word likely to be the most difficult word for the *S* to identify. Several factors made the selection of a difficult word in itself a difficult task. The nature of the language provides strong prompts. Also, the same words tend to be used frame after frame, and *Ss* quickly become aware of this. In some instances it was extremely difficult to select a word that *Ss* would have difficulty in identifying. When this occurred, it was expected that the behavior of reading the total frame would be well enough established so that *Ss* would still read the total frame. Each frame was first presented with the difficult-to-identify word completely covered. Without some type of prompt, such a series of frames would be essentially a series of test items. Therefore, each frame was presented a second time, with the second presentation providing a prompt consisting of the top 25 percent of the word. Following this prompted frame the customary knowledge of results was presented. An example is given in Figure 1. Of course, this frame exists in a certain context and the preferred response is not as difficult as it might appear, especially if the *S* has been reading and examining the preceding frames.

Frame 1 is flashed upon the screen, and a given *S* is called upon to identify the completely covered word. If he cannot

FIGURE 1 Frame 1  
*Example Frame*

ANTITOXINS ARE A TYPE OF  
 ANTIBODY THAT ACTS AGAINST  
 THE \_\_\_\_\_ FORMED BY SOME  
 MICROORGANISMS

Frame 2

ANTITOXINS ARE A TYPE OF  
 ANTIBODY THAT ACTS AGAINST  
 THE ~~POISONS~~ FORMED BY SOME  
 MICROORGANISMS.

Frame 3

ANTITOXINS ARE A TYPE OF  
 ANTIBODY THAT ACTS AGAINST  
 THE POISONS FORMED BY SOME  
 MICROORGANISMS.

identify the word, he says "help" and frame 2 is flashed upon the screen. Any response made to frame 2, be it right or wrong, is followed by frame 3. It should be added that frame 1 provides a prompt in that it tells *S* the "size" of the answer.

Throughout the study records were maintained of each *S*'s responses, making it possible to assess 1) the difficulty *Ss* had in identifying the completely covered word, and 2) the extent to which they were able to utilize the prompts.

*Procedure* The programed textbook *Prevention of Communicable Disease* was divided into 13 independent sections. Each section was similar in length and covered a particular area of communicable diseases. After a given section of the program was completed by a given group, that group of *Ss* would immediately take a test. The tests were noncumulative and did not attempt to assess material learned in previous sections.

Table 1 shows the types of groups and corresponding sections of the program studied under a specified group condition. For the first four sections of the program, all class members were placed together into one group. Using total points on tests 1 through 4 as sole criterion, *Ss* were placed into three "homogeneous" groups: top third, middle third, and bottom third. Each homogeneous group worked together in different

TABLE 1  
*Size and Structure  
 of Groups  
 (N = 27)*

<i>Tests</i>	1,2,3,4	5,6,7,8	9,10,11	12,13
Type and Number of Groups	One Large Group	Three Homogeneous Groups	Three Heterogeneous Groups	Two Homogeneous Groups

sections of the same science room. These three groups studied the programed sections assessed by tests 5, 6, 7, and 8. After completion of test 8, Ss were ranked on the basis of total points obtained on tests 1 through 8 and assigned to one of three "heterogeneous" groups. These groups were formed by taking the top three Ss and randomly assigning each S to one of three groups. Then the next three Ss were randomly assigned to one of the three groups. This process was continued for the whole class until three heterogeneous groups were formed. Those heterogeneous groups studied the materials covered by tests 9, 10, and 11.

Points on the 11 tests were totaled and Ss were again ranked. For the final phase of the study the class was divided into two homogeneous groups. Those ranked in the top half formed one homogeneous group and those in the bottom half formed the second group. Learning under those conditions was measured by tests 12 and 13.

**RESULTS** During the initial phase of this study the total classroom studied together as one group. Learning during that phase was assessed by tests 1, 2, 3, and 4. Using scores on those tests as a criterion, Ss were divided into top, middle, and bottom thirds. The performances of those three groups are shown in Table 2 and presented graphically in Figure 2. On test 5 the mean for the top third of the class was 6.17, for the middle third the mean was 4.57, and for the bottom third of the class the mean was 1.43. On test 13, the final test, means and standard deviations of the top and middle groups were almost identical, while the bottom group had a lower mean and a greater standard deviation.

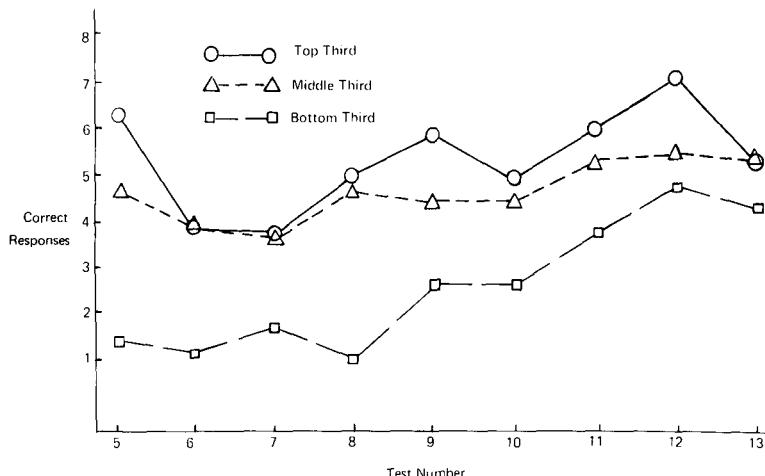
There are two salient features of the data in Figure 2. First, the differences between the top and bottom group were fairly consistent: the top group mean was always greater than that of the bottom group.

A second feature of the data in Figure 2 is the similarity in

TABLE 2  
Means and Standard Deviation for the Three Groups of Ss

Test No.	5	6	7	8	9	10	11	12	13
Top Third	6.2	3.9	3.8	4.6	5.9	4.9	6.0	7.1	5.4
SD	1.5	1.0	1.4	2.5	1.1	0.8	1.0	1.3	0.5
Middle Third	4.6	3.9	3.8	5.0	4.3	4.6	5.3	5.5	5.3
SD	1.5	0.8	1.4	2.1	1.6	0.9	1.3	1.2	0.7
Bottom Third	1.4	1.1	1.7	1.0	2.6	2.7	3.8	4.9	4.3
SD	1.2	0.6	1.0	1.0	1.0	1.0	1.4	0.8	1.2

FIGURE 2  
Group Means on  
Tests 5-13



performance of the top and middle groups. On two tests (the 6th and 7th) the middle group's mean was equivalent to that of the top group.

Throughout the study each *S* was called upon to respond in the presence of his group. If *S* were unable to identify the frame's blank word, a prompt was provided in the form of the top 25 percent of the blanked word. There were three responses an *S* could make: he could identify the completely covered word; he could request "help" and then use the prompt to make the preferred response; or he could be incapable of making the preferred response even in the presence of the prompt.

Records of *Ss'* responses are shown in Table 3. The first column shows the percentage of correct responses by each group when the preferred response was completely blanked out.

The top one-third *Ss* correctly identified 37 percent of the completely covered words, while the bottom third could iden-

TABLE 3  
*Ss' Uses of  
Partial Prompt*

Group	Blank Only	Partial Prompt	Incorrect Responses
Top Third	37	52	11
Middle Third	33	45	22
Bottom Third	17	60	23

tify those words only 17 percent of the time. The middle column shows how *Ss* responded when the preferred response was prompted by allowing the top 25 percent of the answer word to be exposed. The bottom third required that prompt frequently and 60 percent of their correct responding was made in the presence of the prompt.

The third column shows the percentage of *Ss* who were not able to respond correctly even when the prompt was visible. (It should be added that *Ss* could take all the time they wanted to examine the frame and prompt.) The top third responded incorrectly (or not at all) on 11 percent of the frames. The middle and bottom groups responded incorrectly 22 percent and 23 percent of the time, which was twice as great as the top group's error rate.

At the end of the study *Ss* took a test over the total program. There were 29 items on the test. Table 4 shows scores made by the same three groups of *Ss* identified in Table 3. Individual scores are presented to show the degree of homogeneity, i.e., test similarity, within the groups. Three scores are excluded because those *Ss* were absent so often that they had little opportunity to read the programed material, another is excluded because he was absent and could not be reached to take the final test, and a fifth *S* transferred to another school during the study.

The final column in Table 4 shows the medians of the three groups. Medians of the top and middle groups are 27 and 23.5, respectively. Both differ from the bottom group median of 16. Although there is an overlapping among the scores of *Ss* in the top and middle group, only *S-1* in the bottom group has a score greater than that obtained by several *Ss* in both of the upper groups. It is difficult to account for *S-1*'s score on the final test. On all the previous tests his scores resemble those of other *Ss*

TABLE 4  
*Scores by Ss on the Final Test*

Group	Subjects Ranked Highest to Lowest								Mdn
	1	2	3	4	5	6	7	8	
Top	28	28	28	27	26	24	23	23	27
Middle	26	25	25	24	23	23	23	23	23.5
Bottom	26	17	16	16	15	13	12	12	16

in the bottom group, and copying or cheating on the final test was almost impossible.

Data in Table 4 suggest that if the group technique were continued, it would be possible to establish two similar groups: one composed of the 16 highest scoring *Ss* and a second composed of the six lowest scoring *Ss*.

*Time Data* The study lasted a total of 13 days. Each daily session began within two or three minutes of the school bell and lasted until the dismissal bell rang 45 minutes later. In other words, *Ss* read the programmed material for approximately 40-45 minutes a day, with each daily session punctuated by a test.

Time records for individual groups were maintained. They indicate that the top, bottom, and middle groups took similar amounts of time to finish a given segment. It is probable that any time differences that did occur could be traced to the projector operators rather than the groups, since the projector operators had to call on *Ss*, evaluate and record their responses, as well as operate the projector.

*DISCUSSION* The main objective of this study was to determine whether the group use of programmed materials would aid in creating and identifying homogeneous groups of students. The results indicate that stable, homogeneous groups could be identified and that this identification could occur at an early state, e.g., after the first test of retention. But these groups could not be artificially generated by doing such things as dividing the total classroom into three equally sized groups. In this study's classroom there was a definite consistency in the performance of individual *Ss*, and only one *S* gave evidence (on the final test) that he should possibly have been interacting with the higher performing *Ss* rather than the lower performing *Ss*. In other words, he could be receiving the extra-program experiences designed for the top students.

The consistency in student performance reported in this study is the type that normally obtains in a classroom when any type of programed materials are introduced and no efforts are made to otherwise alter student motivation. A distressing feature of existing programs is that there is no discernible change in student behavior when they are introduced into the classroom. An initial hope of educators was that programed instruction with its low error rate, immediate knowledge of results, etc., would make it possible to allow the less competent student to move at his own rate. In this way he would learn and retain the subject matter just like the more able students. Unfortunately students who historically have shown little interest in doing well in their school work retain this lack of interest with programed materials. If changes are to be effected with programed materials, then steps must be taken to alter the motivation of the student. This goes back to a fundamental problem in education: identification of some types of consequences for which the uninterested student will work. We have an abundance of evidence to show that good grades are not adequate reinforcers for many students.

Since I used a unique type of prompt, i.e., covering part of the required response, throughout the study, it is not possible to assess any differential influence it may have produced. A subjective evaluation is that it was more effective than the regular program. Students appeared more attentive and seemed to be doing a more thorough job of analyzing each frame. It certainly seemed to reduce student boredom.

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